

## Length, Slovenia, MIRS/UM-FS/LTM (MIRS/University of Maribor, Faculty for Mechanical Engineering/Laboratory for Production Management)

Calibration or Measurement Service			Measurand Level or Range			Measurement Conditions/Independent Variable		Expanded Uncertainty						
Class	Instrument or Artifact: Measurand	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?	NMI Internal Service Identifier	Comments
End standards	Gauge block: central length $L$	Mechanical comparison	0.5	100	mm			$Q[35, 0.5L], L$ in mm	nm	2	95%	No	5	Approved on 14 September 2010
End standards	Length bar (long gauge block): central length $L$	1-D comparator and mechanical probes	125	1000	mm			$Q[100, 1L], L$ in mm	nm	2	95%	No	6	Approved on 22 March 2005
Diameter standards	External cylinder: diameter $L$	1-D comparator and laser interferometer and 2 flat probes, gauge substitution	1	300	mm			$Q[0.5, 3L], L$ in m	$\mu\text{m}$	2	95%	No	9	Approved on 22 March 2005
Diameter standards	External cylinder (pins or wires): diameter $L$	1-D comparator and laser interferometer and 2 flat probes	0.1	10	mm			$Q[0.3, 3L], L$ in m	$\mu\text{m}$	2	95%	No	10	Approved on 22 March 2005
Diameter standards	Sphere (ball): external diameter	1-D comparator and laser interferometer and 2 flat probes	0.1	10	mm			$Q[0.3, 3L], L$ in m	$\mu\text{m}$	2	95%	No	12	Approved on 22 March 2005
Angle instruments	Electronic levels: inclination angle	Sine bar, gauge blocks	-3	3	mm/m			1.3	$\mu\text{m}/\text{m}$	2	95%	No	13	Approved on 22 March 2005
Angle instruments	(spirit) bubble levels: inclination angle	Sine bar, gauge blocks	-3	3	mm/m			11	$\mu\text{m}/\text{m}$	2	95%	No	14	Approved on 22 March 2005
Angle artefacts	90 ° square: squareness	CMM	90	90	°	Maximal dimensions	500 mm x 500 mm	0.9	"	2	95%	No	15	Approved on 22 March 2005
Angle artefacts	90 ° cylinder: squareness	CMM	90	90	°	Maximum length	500 mm	0.9	"	2	95%	No	16	Approved on 22 March 2005
						Maximum diameter	300 mm							
Screw standards	Thread plugs, plain: pitch diameter $L$	Micrometer and wires, CMM and T stylus (comparator method)	1	300	mm			$Q[2.5, 4.5L], L$ in m	$\mu\text{m}$	2	95%	No	18	Approved on 22 March 2005
Screw standards	Thread plugs, plain: pitch	CMM and T stylus	0.5	50	mm			0.8	$\mu\text{m}$	2	95%	No	19	Approved on 22 March 2005
Screw standards	Thread rings, plain: pitch diameter $L$	CMM and T stylus (comparator method)	6	300	mm			$Q[2.5, 4.5L], L$ in m	$\mu\text{m}$	2	95%	No	20	Approved on 22 March 2005
Screw standards	Thread rings, plain: pitch	CMM and T stylus	0.5	50	mm			0.8	$\mu\text{m}$	2	95%	No	21	Approved on 22 March 2005

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Class	Instrument or Artifact: Measurand	Instrument Type or Method	Minimum value	Maximum value	Units	Parameter	Specifications	Value	Units	Coverage Factor	Level of Confidence	Is the expanded uncertainty a relative one?		
2-D, 3-D instruments	CMM, linear dimension error	Performance test with gauge blocks to VDI/VDE 2617	0	1000	mm			Q[1, 2L], L length in m	µm	2	95%	No	22	Approved on 04 May 2006
Laser radiations	Frequency stabilized laser: absolute frequency	Optical beat frequency	474	474	THz			24	kHz	2	95%	No	23	Approved on 01 April 2010
Laser radiations	Frequency stabilized laser: vacuum wavelength	Optical beat frequency	633	633	nm			0.04	fm	2	95%	No	23	Approved on 01 April 2010
Laser radiations	Frequency stabilized laser: vacuum wavelength	Optical beat frequency	633	633	nm			1.0E-09		2	95%	Yes	24	Approved on 01 April 2010
Length instruments	1D measuring machine: error of indicated displacement, L	Laser interferometer	0	5	m			Q[0.03, 3.5L], L in m	µm	2	95%	No	1	Approved on 14 September 2018
Length instruments	Height measuring instrument: error of indicated displacement, L	Laser interferometer	0	2	m			Q[0.03, 3.5L], L in m	µm	2	95%	No	2	Approved on 14 September 2018
Length instruments	Gauge block comparator: error of indicated displacement, L	Gauge block set	-10	10	µm	Gauge block length	maximum 100 mm	(20 + 0.2L), L in mm	nm	2	95%	No	3	Approved on 14 September 2018
Line standards	Surveyor, engineer tape: line spacing, L	Laser interferometer and CCD microscope	0	200	m			(10 + 12.5L), L in m	µm	2	95%	No	8	Approved on 14 September 2018
Diameter standards	Internal cylinder (ring): diameter, L	CMM substitution principle	2	300	mm			Q[0,2, 2.8L], L in m	µm	2	95%	No	11	Approved on 14 September 2018
Flatness standards	Surface plates: flatness	Electronic levels	0	100	µm	Maximum length, L	3 m	Q[0.3, 0.2L], L in m	µm	2	95%	No	17	Approved on 14 September 2018
						Maximum width	2 m							
Line standards	Precision line scale: line spacing, L	Laser interferometer and CCD microscope	0	500	mm			Q[0.09, 1.1L], L in m	µm	2	95%	No	25	Approved on 14 September 2018